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Space Allowances for Meal Preparation and Service in the Southern Rural Home

University of Tennessee Agricultural Experiment Station

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by
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CONTENTS

	Page
SUMMARY	2
ACKNOWLEDGMENT	5
PURPOSE OF INVESTIGATION	7
METHODOLOGY	7
The Laboratory Facilities	7
Selection of Furnishings and Equipment	7
Provision for Three-Kitchen-Dining Arrangements	8
Construction of the Dining Table	10
The Cooperating Homemakers	10
The Collection of Data	11
The Design of the Meal Replication	11
Instructions to the Cooperators	12
Daily Preparation in the Laboratory	12
Records of the Homemaker's Activity	12
Records Obtained from the Participants of the Meals	12
RESULTS	13
Space for the Dining Area	13
Size of the Table	13
Effect of Type of Service	14
Space Around the Table	15
Space for Storage of Dishes	16
Space for Food Preparation	22
The Cooperator's First Choice	22
The Traffic Pattern	23
Counter Height and Clearance	23
Counter Space for Mixing	24
Counter Space for Serving	24
Space to Clear and Wash Dishes	24
Space for Storage of Utensils	25
BIBLIOGRAPHY	29

SUMMARY

- Space needed for activities involved in meal preparation and service is related to the size of the people, their possessions, their customs, and their habits of work. The kind and quantity of possessions is related to the socioeconomic status, family size, and the length of time a family has been organized. Older homemakers tended to report more possessions than younger homemakers. If a family is to use space allowances reported here, it needs to be able to compare its situation with the conditions under which the allowances were developed. Some habits of working are indicated and the manner of serving is described because they influence efficient use of space.

Space for the Dining Area

- The necessary serving dishes and a simple cover for each of six people may be placed on a table 36 x 72 inches in size without overcrowding. Thirty-six inches might be considered the minimum width of the table if people are to be seated on both sides of the table.

- The average amount of space between the chair back and the edge of the table when the subjects were eating was 15 inches. Allowing for the thickness of the chair back, plus 12 to 13 inches for the depth of the body of the person serving or passing behind those seated, 30 inches may be considered the minimum margin between the table edge and the nearest barrier. On the basis of this study a dining area 8 x 11 feet would be considered the minimum for six people.

Space for Storing Dishes

- The diameters of different types of dishes varied from 1 to 1½ inches within the type. The thickness of material from which the dishes are made as well as the shape causes a range in the height of the stacks of the same number of dishes.

- The least margin above stacks of dishes was 1½ inches. A half-

inch margin was allowed at the side of each stack and between stacks.

- Four shelves within the "easy reach" zone above the work counter near the sink will accommodate the "everyday" dishes on the basic lists. The width of the wall cupboard needed for the low socioeconomic group would range from 28 to 31 inches, inside measurement, and that for the high socioeconomic group would range from 32 to 38 inches depending on the size of family.

Space for Food Preparation

- Seven of the eight homemakers who prepared meals in the laboratory selected Arrangement III (Figure 3) as their first choice. This arrangement incorporated the following features: a work triangle within limits of 12 to 22 feet, the perimeter being 16.7 feet; a short distance between range and the sink and the refrigerator and sink; and the range placed at right angles to the sink.

- At least 36 inches of space is needed between the counter or appliances and the dining table.

- Little use was made of the corner counter space. Supplies and utensils were kept within the limits of the 32 inches of counter space. The counter was rarely entirely covered. The full 24-inch depth of the counter was used when pie crust or biscuit dough was rolled out. Counter space is most crowded just before a meal when food is being put into serving dishes. Eighteen inches at right of sink was adequate for stacking soiled dishes but more space is needed to work freely.

Space for Storage of Utensils

- Space at two different centers is desirable if utensils are to be stored at "place of first use." Skillets should be stored in or near the range. Other utensils with exception of casseroles are more often first used at the sink. Utensils reported as "frequently used" by families of the low socioeconomic group having seven or more members were stored in a drawer 15 x 8½ x 21½ inches plus 22 inches of 12-inch shelving.

Space Allowances for Meal Preparation and Service In the Southern Rural Home

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PURPOSE OF INVESTIGATION

The purpose of the investigation was to study the space needs related to the meal preparation and meal service area in rural homes in the South. The project was a part of the Southern Regional Study, **Functional Requirements and Facilities for Southern Rural Homes.** Basic information regarding family possessions and the pattern of family living was available from two extensive regional surveys: **Farm Housing in the South,** and **Farm Family Food Consumption in Three Types of Farming Areas in the South.**

Previous studies of the storage needs related to household furnishings used in meal service had been reported in other parts of the United States (10, 19, 26). Likewise investigations had been made of space required for the movements which the meal preparation and meal service activities involve, but no studies of the applicability to the South were available. It seemed desirable, therefore, (1) to examine the recommendations for space needs developed elsewhere with respect to their adaptability to the demands of Southern rural ways; (2) to study the effect of arrangement of facilities on the space needed; and (3) to establish storage space requirements based on the kind and quantity of household articles reported by the respondents of the housing survey.

METHODOLOGY

The Laboratory Facilities

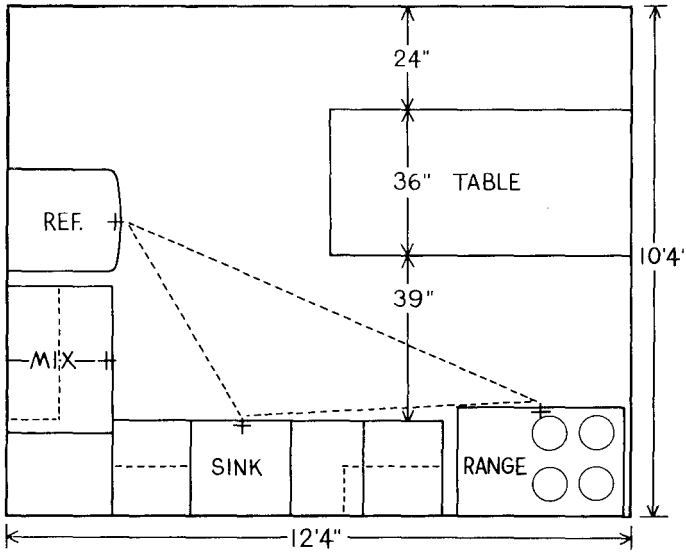
Selection of Furnishings and Equipment.—To test the recommendations for kitchen arrangements and space allowances, the

housing laboratory was equipped with flexible facilities which permitted various arrangements of the major appliances and storage cabinets. Lists of utensils, tableware and linens were compiled on the basis of the inventories reported by 754 families participating in the Southern Regional Housing Survey of 1948-49 (5). Articles in the china and housewares departments of a large mail order company, several department stores, several chain variety stores, and small business concerns were measured to determine sizes of such articles which trade seemed to demand. The kinds and number of articles purchased for use in the laboratory approximated those reported as being in the inventories of 50 percent of the high socioeconomic group, and at least 25 percent of the low socioeconomic group.

Provision for Three-Kitchen-Dining Arrangements.—Data from the housing survey indicated that mealtime in the morning and evening finds the Southern rural family assembled together. Fifty percent of the families have one or two guests at family meals once a week or more. If the mealtime is to function as a time for the family and friends to share experiences and ideas, it seemed that the dining area should be planned to foster this family custom.

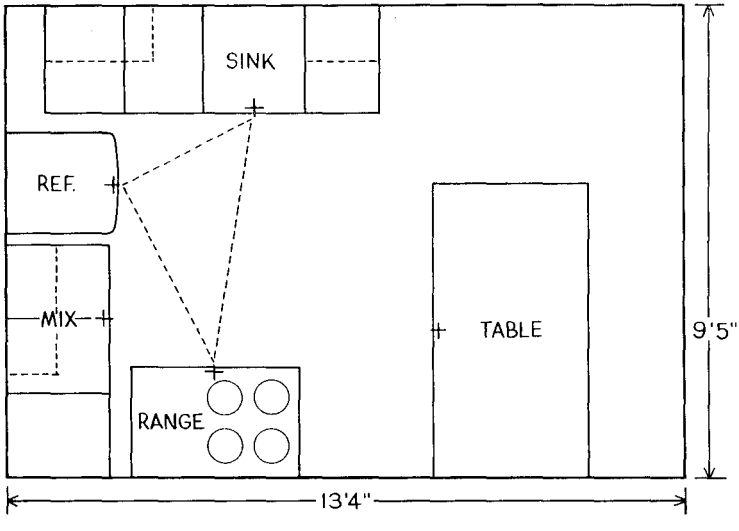
More than three-fourths of the homemakers interviewed during the survey wanted to have a dining area in or adjoining the kitchen where everyday meals might be served. Half the respondents would serve only "company" and/or Sunday meals in the dining room (5). Therefore three kitchen-dining areas, two in L arrangement and one in U arrangement, were used to study the effect of changing arrangement and sequence on the pattern of counter use. (See floor plans, Figures 1, 2, 3.) No study was made of the adequacy of space for serving meals at a bar type counter featured in some of the present day house plans. Such accommodations did not appear suitable to the mealtime pattern in the rural South.

Each arrangement was so constructed as to permit observation of the adequacy of the space between barriers for movements such as stooping, walking, rising or being seated. The spaces allowed were equal to or less than the recommendations found in the literature (3, 13, 19). The three arrangements represented the range in perimeter of the "work triangle" suggested by the Small Homes Council (Handbook p. 15).



Scale: ¼ inch = 1 foot **+ Measuring spot**

Figure 1.—Floor Plan, Laboratory Arrangement I.



Scale: ¼ inch = 1 foot **+ Measuring spot**

Figure 2.—Floor Plan, Laboratory Arrangement II.

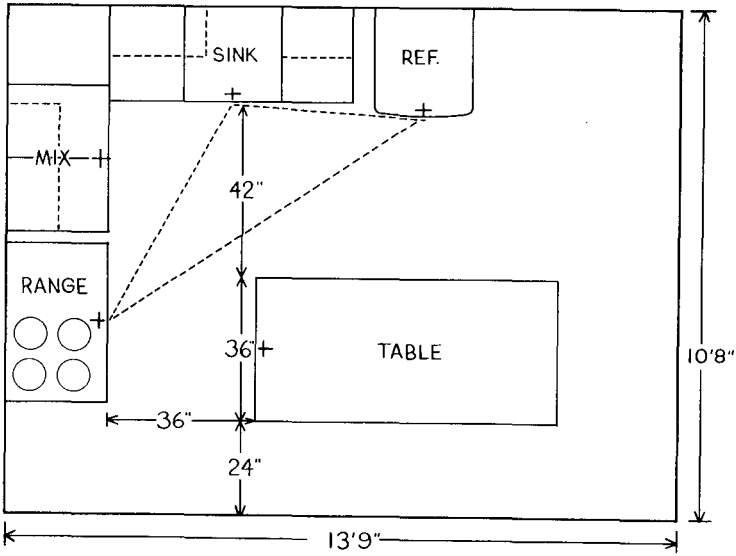


Figure 3.—Floor Plan, Laboratory Arrangement III.

Table 1.—Distances in the Work Triangles of the Laboratory Arrangements as Compared with Recommendations of the Small Homes Council

Distance between	Arrangement I	Arrangement II	Arrangement III	Recommended allowances (9)
	Feet			Feet
Sink and range	6.0	5.2	5.1	4 — 6
Refrigerator and sink	4.8	3.0	3.9	4 — 7
Range and refrigerator	9.1	4.2	7.7	4 — 9
Perimeter	19.9	12.4	16.7	12 — 22

Construction of the Dining Table.—The dining table was constructed to permit changing the size of the top surface. Two 72-inch plywood tops, one 40 inches wide as recommended by Wilson (19) and one 36 inches wide, were made in sections that latched firmly together and clamped securely in place. The 40-inch size was used 21 times and the 36-inch size 19 times.

The Cooperating Homemakers

Eight homemakers from rural areas in Knox County prepared and served meals in each of the three laboratory arrangements. Scored according to the modified Sewell's Scale used in the regional housing survey, their families would have been classified in the

high socioeconomic group. All were recognized leaders in the communities from which they came. They were selected on the basis of the range in body measurements and body conformation found in the data obtained from 74 East Tennessee women measured at the Tennessee Valley Agricultural and Industrial Fair in 1952. (Table 2) The mean measurements of the 74 women were similar to those reported in studies of women made in other parts of the United States (18, 19).

*Table 2.—Measurements of Eight Knox County Homemakers as Compared with Those of Women Measured at the Tennessee Valley Agricultural and Industrial Fair**

Measurement	Women measured at TVA & I Fair		Range for Knox County homemakers
	Mean	Standard deviation	
	Inches		Inches
Stature	64.0	2.1	60.4 — 66.7
Eye level	59.7	2.2	56.7 — 62.5
Shoulder height	52.9	1.8	50.5 — 56.2
Elbow height	39.3	1.5	37.7 — 42.9
Bust depth	9.7	1.4	8.7 — 10.9
Abdominal depth	10.1	1.5	9.1 — 11.6
Width — arms bent	20.5	1.7	18.3 — 23.7
Greatest width below waist	14.1	1.0	14.0 — 16.1

*Source of data by Moxley (17).

The Collection of Data

The Design of the Meal Replication.—The food items on the menus were those reported frequently by participants in the most recent farm family food consumption study made in the South (4, 16, 20). Two menus were used:

Meal A	Meal B
Ground Beef Patties	Fish Fillets
Boiled Potatoes Green Beans	Hash-browned Potatoes
Cabbage Slaw	Greens Sliced Tomatoes
Biscuits Butter	Cornbread Butter
Canned Peach Halves	Apple Pie
Coffee	Milk or Iced Tea

A total of 40 meals was prepared. The design of the meal replication was such that each homemaker prepared a practice meal and a repetition of this meal in the first arrangement in which she worked. She prepared both menus in the next arrangement. She

repeated one of the menus in the last arrangement. No more than three homemakers prepared their first meals in the same arrangement.

Instructions to the Cooperators.—The cooperators were asked to prepare and serve the meals as nearly as possible as they would at home. They were requested to ask for utensils or tableware which they used regularly and which were not provided in the cabinets. No recipes were given. Each homemaker was contacted before her first trip to the laboratory and asked to indicate her customary choice when alternate ingredients might be used.

Daily Preparation in the Laboratory.—Before each replication, a laboratory worker inspected the cabinets and the refrigerator to see that everything was in its assigned place. Some articles were placed so that the homemaker had to bend deeply, stoop or stretch upward. One menu provided opportunity to observe the space used for peeling potatoes, and it seemed logical to assume that space for peeling apples would be similar.

Before each trial, the floor was covered with white wrapping paper, secured in place with masking tape, for recording the track patterns.

Records of the Homemaker's Activity.—While she worked, the homemaker wore a pair of sandals strapped over her shoes. On the soles of the sandals were sponge arrows stained with a mixture of show card paint, water and glycerin. One color was used for the preparation period; another for the clean-up period. The resulting track pattern on the paper permitted a study of the area of heaviest traffic and of the position of the feet of the worker as she moved from station to station: whether she sidestepped, or turned and moved parallel to the face of one of the cabinets.

A detailed written record and a memomotion film were made of the homemaker's activities as she prepared and served the meal and cleared away afterward. She was encouraged to feel free to comment on her feelings as she worked in each arrangement. When she had used all three arrangements she was asked her preference.

Records Obtained from the Participants of the Meals.—Each cooperator agreed to arrange for additional persons, her immediate family, other relatives, or friends to share the meal she prepared. In instances where her plans were changed at the last moment,

men and women from the staff or student body were substituted.

Each of the participants at the meal wore sandals strapped over his shoes. The arrows on the sandals were stained with different colors for each person in order to identify the pattern of approach to chairs in the different locations about the table. These records provided for a study of the distance from the edge of the table to the position of the subject's feet.

As the participants sat at the table eating, the positions of their chairs were marked on the paper which covered the floor. When they left the table each was asked to leave his chair in the position from which it was possible to rise. These positions were similarly recorded. After the homemaker had finished her work in the kitchen, the chairs were returned to their respective positions and measurements of the desired distances were taken with a steel measuring tape. Two distances were recorded: (a) the distance from a specified spot at the center of the back of the chair to the edge of the table when the chair was in the same position as when the subject was eating, and (b) the distance from the same spot on the chair to the edge of the table when the chair was in the position from which the subject was able to rise.

If the guests at the meals had time, some body measurements were taken. Data were obtained from 26 men and 69 women.

RESULTS

Space for the Dining Area

Size of the Table.—The optimum size of the table depends on (a) the number of people to be accommodated, (b) the type of menu to be served, (c) the type of meal service followed, and (d) the size of the dishes used.

One of the measurements obtained from the sample of East Tennessee women was the width of the body at the elbow line when the arms were bent. The measurement was taken while the women held a tray bearing a 10-pound load. The measurement was considered an estimate of the width necessary to accommodate the distension of the elbows which accompanies lifting a load or manipulating the hands in front of the body at the counter or table level. The average width was 20.51 inches with a standard deviation of 1.72 inches. This suggests that 24 inches of table space per person, or cover, the recommended allowance found in

most of the housing references examined, would be adequate space.

Wilson recommends a table 76 by 40 inches wide for serving six persons (26) using "family style" service. The men and women who took part in the test meals said they had "room enough" at a table 72 inches long, but several added they "wouldn't want the space any smaller." In two laboratory arrangements, three subjects sat on each long side of the table. As one end of the table was against the wall, 4 of the 6 were definitely confined in their 24-inch spaces. In the third arrangement, one person sat at each end of the table and two sat at each side.

Wilson says, "A man 6 feet tall was found to need 20 inches leg room. As men may sometimes be seated opposite one another, the width of the dining area should permit the use of a table at least 40 inches wide" (26).

Twenty-six of the men who participated in this study were measured. Their range in stature was 64.7 to 77.8 inches. This is slightly greater than the mean of 69.0 inches which was reported by Hooten and his associates (23). In no case did the tracks of any of the men, made as they shifted their feet under either the 36- or the 40-inch table, indicate they were interfering with the feet of the person opposite. However, the sandals they wore may have tended to restrict their movement slightly. Probably 36 inches might be considered a minimum width from the standpoint of leg room. Women students in home economics classes—using a conference table 32 inches wide—found their knees and feet frequently interfered with those opposite.

Effect of Type of Service.—While information regarding the type of menus served was available, no reports of investigations of the frequency with which the various types of meal service are used in the South were found. With the exception of one, the meals prepared in the laboratory were served in the "family style" in which the serving bowls and platters are passed around the table and each person helps himself. The homemakers were able to put the necessary dishes and a bowl of flowers on the table 72 x 36 inches in size without overcrowding, but there was no surplus room.

In all but one instance, the cover consisted of a dinner plate, a cup and saucer, one or two glasses, a knife, a fork, a spoon, and a paper napkin. Several times tomato slices were placed on a platter with lettuce leaves or pepper strips as a garnish, but in

only one instance were they served as individual salads. Slaw was always served in a large bowl.

In almost all cases, main course dishes were removed and dessert served as a separate course. Usually a second fork was provided for eating pie. Some hostesses served the dessert from their places at the table after removing dinner plates and serving bowls.

The inventory records from the housing study indicate the simple cover used was probably typical of "everyday" meals in the region. Less than one-fifth of the familes of the high socioeconomic group reported having bread and butter plates. About one-third of them reported bread and butter plates among their "guest" dishes. A little over half reported salad forks for "everyday" use.

The width of the tables at which company meals are to be served might well be greater. The housing inventories listing "guest" dishes indicate more elaborate covers are used for company meals than for family meals, especially in the high socioeconomic group. The size of the serving dishes used by both groups was consistently, and usually, significantly greater (7). Eight was the median number of persons the homemakers reported they served at company meals.

Space around the table.—The amount of space available was a highly significant factor in the amount of space the participants at the laboratory meals used to rise from their places at the table. Those who had 30 inches or more used more space than those who had less than 30 inches available, ($F_{1,222} = 7.756$; $F_{1,200} = 6.76$ at 1% level) and the men significantly more than the women ($F_{1,222} = 5.481$; $F_{1,200} = 3.89$ at 5% level).

The average distance from edge of table to back of chair when the chair was in the position which permitted the occupant to leave the table was as follows:

Available space

	30 inches or more		Less than 30 inches	
	Mean	Standard deviation	Mean	Standard deviation
	Inches		Inches	
Men	21.5	3.2	20.5	1.5
Women	20.4	2.9	19.3	2.6

The least space between the edge of the table and the nearest barrier which was tested was 24 inches. The guests were able

to seat themselves and rise from their chairs, but their verdict was that the space should be no smaller. It should be noted that the line from the center back of the chair to the base of the chair legs was comparatively straight. This permitted making full use of the space available and is a consideration in selecting chairs for the dining area which must be kept at a minimum.

Sufficient space to permit others to pass behind seated persons is desirable. No significant difference was found between men and women with regard to the amount of space between the chair back and the edge of the table when the subjects were eating. Whether little or much space was available was not significant. Whether the person had both elbows free or one or both confined did not significantly affect the space he used. The average space was 15.0 inches.

On the basis of this study, 16.8 inches should be a reasonable allowance for 80 percent of the people, and 18.7 inches should care for 95 percent. Allowing for the thickness of the chair back plus 12 to 13 inches for the depth of the body of a person serving or passing behind those seated, 30 inches should be about the minimum margin between the table edge and the nearest barrier. Thirty-six inches would be ample. Not all homemakers who served in the laboratory attempted to move behind the subject seated in the 30-inch space. Those who did moved with considerable care. All moved freely behind those seated in the 36-inch margin.

Space for Storage of Dishes

There is a great variety of sizes and shapes of dishes and glassware available. Therefore any estimate of space which will meet the needs of many different families is at best a rough approximation.

The diameters of the different types of dishes measured varied from 1 to 1½ inches within the type. If the diameter on one cover item in a set approached the maximum, other items, being in proportion, tended to approach the maximum also. The thickness of material from which the dishes are made as well as their shape causes a range in the height of the stacks of the same number of dishes. The range in diameter and in height of stacks of commonly used dishes as observed by the investigators are as follows:

Item	Range in diameter Inches
Dinner and luncheon plates	9 — 10½
Salad or pie plates	7 — 8½
Bread and butter plates	6 — 7
Soup plates, rim soups, "deep" plates	7 — 8½
Saucers	6 — 7
Cereal bowls	6 — 7
Sauce dishes	5 — 6
Cups (includes handles)	3 — 5
Glasses	2½ — 3

Item	Range in height of specified number of items		
	6	8	12
	Inches		
Dinner and luncheon plates	3 — 3½	3½ — 4½	3½ — 6½
Salad or pie plates	1½ — 2½	2 — 3	3 — 5
Bread and butter plates	1 — 2	1½ — 2½	2½ — 3½
Soup plates, rim soup, "deep" plates	2 — 3	3 — 3½	3½ — 4½
Saucers	1½ — 3	2 — 3½	3 — 4½
Cereal bowls	2½ — 4	3 — 5	4 — 7
Sauce dishes	2 — 3	2½ — 7	4 plus

Stacking dishes of like size and shape is an accepted practice. Combinations of like shapes but different sizes will usually form a balanced stack since they nest one within the other. However, removing the dishes close to the bottom of the stack may be difficult. It has been noted that when sizes were similar there appeared to be slowing down as the hand selected and grasped the desired size. Difficulty appeared to stem from the weight which must be lifted in order to remove the desired article from under the stack, or portion of the stack. In computing space for the dishes, an arbitrary limit of 10 pounds was used for stacks of like dishes. Ten pounds is the lifting limit physicians set for several of the heart patients referred to the East Tennessee Heart Association's committee on work simplification. In stacks where one hand would be required to bear the weight of part of the stack while the other removed the desired article, a maximum limit

of 5 pounds was set for the portion to be lifted. Rye's work supports these limits (21).

Table 3 gives the range in weights of selected kinds of dishes in common use. On the basis of the weights tabulated, stacks were determined thus:

plates of one kind not to exceed twelve;
plates of assorted kinds not to exceed seven;
individual bowls of like sizes not to exceed eight;
individual bowls of assorted sizes not to exceed seven;
sizes of bowls in the same stack not to exceed two;
platters not to exceed three, the bottom one weighing no more than 5 pounds;
serving bowls of like size and shape not to exceed four;
serving bowls of assorted sizes may total four providing no more than two bowls 8 inches or larger in diameter have to be lifted to get the size stored at the bottom.

Table 3.—Weights of Selected Dishes in Common Use

Item	Range in weights
Stack of four	
dinner or luncheon plates	4 lb. 2 oz. — 5 lb. 14 oz.
salad or pie plates	1 lb. 14 oz. — 1 lb. 12 oz.
bread and butter plates	1 lb. 1 oz. — 1 lb. 12 oz.
soup plates	2 lb. 2 oz. — 3 lb.
saucers	1 lb. — 1 lb. 15 oz.
cereal bowls	1 lb. 8 oz. — 2 lb. 12 oz.
sauce dishes	1 lb. — 2 lb. 8 oz.
One platter	
under 12" long	7 oz. — 1 lb. 7 oz.
12" to less than 14"	1 lb. — 1 lb. 8 oz.
14" to less than 16"	1 lb. 15 oz. — 3 lb. 8 oz.
16" to less than 20"	3 lb. 2 oz. — 4 lb. 1 oz.
20" and over[1]	7 lb. 9 oz.
One serving bowl	
8" and less than 10"	12 oz. — 2 lb. 8 oz.
10" and less than 12"	12 oz. — 2 lb. 12 oz.

[1]Only one of this size was weighed.

Wilson (25) recommends that "in estimating the distance between shelves, allow 2 inches above dishes that are handled from the top; allow 1 inch above those that are handled from the side." What is meant by "handling from the top" and "handling from the side" is not quite clear. Whether the measurements which she gives of heights of dishes in common use include the margin is not indicated. The difference in the heights of stacks of cover items measured at Tennessee from those given by Wilson are greater than those for the serving dishes.

The least margin above stacks of dishes stored in the cupboards of the laboratory test kitchen-dining area was 1½ inches. A half-inch margin was allowed at the side of each stack or between stacks. No subject using the dishes appeared to have, or reported having, difficulty when removing stacks of dishes or separate plates or platters. The margin did not, however, permit removing a bowl from a stack without slightly shifting the stack.

From observation of persons removing articles from shelves, it seemed that the amount of tilt given an article as it was taken from the shelf was related to how far outside the vertical area between the elbow height and the eye level of the worker the article was located. This suggests that a uniform margin allowance above the articles for handling would not be satisfactory. If a 2- or 3-inch allowance above the articles or stacks of articles were to be made and the design for the storage unit provided flexibility in placement of shelving, adaptation would be possible. Each homemaker could move the shelves so as to put frequently used articles within her reach and shift the allowance for clearance accordingly.

Some idea of the variation to be accommodated may be obtained from the following measurements of women obtained during the progress of the project:

Measurement	Mean	Standard deviation
	Inches	
Highest reach without strain over 12″ obstruction	72.0	3.6
Eye level	64.0	2.1
Shoulder height	52.9	2.2
Elbow height	39.3	1.5
Palm height, arms at sides	30.1	1.4

In view of these measurements and Bratton's findings related to energy consumption for reaching up to the 72-inch level and bending to the 22-inch level, the area between may be considered the area of "easy reach" within which it would seem well to attempt to store the items used most frequently (1, 2). Flexibility which makes the most effective use of the space is very desirable. In the housing laboratory it was possible to place four shelves within the "easy reach" zone above the work counter. When the estimated amount of linear feet of 12-inch shelving needed to hold the "everyday" dishes on the basic lists (Table 4) is divided

by four and handling margins added, the width of the wall cupboard needed for the low socioeconomic group would range from 28 to 31 inches, inside measurement, and that for the high socioeconomic group would range from 32 to 38 inches depending on the size of family (Table 5). The small differences in the needs within socioeconomic groups occur as the result of significant and persistent differences in the number of items for individual covers and the size of the serving dishes accompanying increase in the size of family (7).

While the liberal lists of the "everyday" dishes include some types of articles not found on the basic lists, a considerable difference lies in the increased number of certain articles common to both lists. The menus served in the South indicate little likelihood that all dishes would be used daily; therefore it was assumed that at least one shelf of the duplicates might be placed above the zone of "easy reach." The range in horizontal width for a storage unit that would provide for the dishes included in the liberal list was estimated at 37 to 42 inches for the low socioeconomic group and 44 to 49 inches for the hight socioeconomic group (Table 6).

The findings of Heiner and Steidl (11) show that storage of dishes near the dishwashing center is more step-saving, taking the meal process as a whole, than is storing them near the place of "first use." Since the homemakers said they wished to serve "everyday" meals in or close to the kitchen, it would seem logical to plan to store near the sink the dishes used daily.

Table 4.—Basic Lists of "Everyday" Dishes

Low socioeconomic group	High socioeconomic group
1 stack (8-12) dinner plates	1 stack (12) dinner plates
2 stacks (6-8) bowls	1 stack (8) salad plates
6 cups and saucers	2 stacks (2 sizes) bowls
8-12 glasses (water or iced tea)	8 cups and saucers
2 stacks serving bowls*	18 glasses (both water and iced tea)
2 platters	2 stacks serving bowls*
2 pitchers	2-4 platters
1 cream and sugar set	2 pitchers
	1 cream and sugar set
	2 relish or jelly dishes

*Two shapes: round, and oval or square, were reported.

Table 5.—Horizontal Width of Shelves for Storage Units for "Everyday" Dishes at the Basic Level for Two Socioeconomic Groups

Socioeconomic group	Size of family	Total length of shelving, inches	Recommended width for unit (4 shelves), inches
Low	2-4	99.0	28
Low	5-6	108.0	30
Low	7 plus	112.5	31
High	2	116.5	32
High	3-4	135.5	37
High	5 plus	138.5	38

Table 6.—Liberal Lists of "Everyday" Dishes

Low socioeconomic group	High socioeconomic group
1 stack (12) dinner plates	1 stack (12) dinner plates
2 stacks (6-8)bowls	1 stack (8) salad plates
12 cups and saucers	3 stacks (9-12) bowls
18-24 glasses (water or iced tea)	12 cups and saucers
1 stack of extra plates	18-24 glasses (water or iced tea)
3 stacks of serving bowls	8 juice glasses
2 platters	3 stacks serving bowls
2 pitchers	2 platters
1 cream and sugar set	4 pitchers
2 relish or jelly dishes	1 cream and sugar set
1 serving plate	3 relish or jelly dishes
	1 serving plate
	1 gravy boat

Table 7.—Horizontal Width of Shelves for Storage Units for "Everyday" Dishes at the Liberal Level for Two Socioeconomic Groups

Socioeconomic group	Size of family	Total length of shelving, inches	Recommended width for unit (5 shelves), inches
Low	2-4	163.5	37
Low	5-6	171.0	38
Low	7 plus	189.5	42
High	2	198.0	44
High	3-4	209.5	46
High	5 plus	223.0	49

A little over half the families participating in the housing survey reported serving company meals as frequently as once in 2 weeks. The majority said that if they had a dining room they would serve only company and Sunday family meals there. At the lower economic levels, provision for more than one dining area does not seem economically sound. The basic list of "guest" dishes for the low socioeconomic group would require an estimated 45 inches of 12-inch shelving. It would seem reasonable to incorporate this amount of shelf space into the "everyday" storage, recognizing that most of it would be out of the "easy reach" zone.

The estimated space required to store the guest dishes on the liberal list for the low socioeconomic group and the basic list for the high socioeconomic group was similar, 160.5 and 168.5 linear inches respectively. A storage unit providing the required shelving placed near the kitchen sink would crowd the storage of articles used daily in tasks performed there.

Heiner and Steidl (11) reported that storing the dishes near the table made the preparation period of the meal less time-consuming. As this preparation period is one of great demand on the hostess, storing "guest" dishes near the dining table would make table setting easier and would also relieve the pressure for space near the kitchen sink. In addition, the vertical space ordinarily taken up by the work counter and counter clearance would be available for shelving within "easy reach."

Space for Food Preparation

The Cooperator's First Choice.—While the observations of as few as eight subjects can not be considered conclusive, they serve to further confirm some of the reports of previous research concerned with the food preparation area. Homemakers might be expected to choose the laboratory arrangement most similar to their own kitchens. A detailed study, however, indicates that they chose an arrangement which gave them advantages they enjoyed at home plus others (8). Seven of the eight who prepared meals in the laboratory selected Arrangement III as their first choice.

Arrangement III incorporated the following features recommended as advantageous by previous research: a work triangle within the limits 12 to 22 feet, the perimeter being 16.7 feet; a short distance between the range and the sink and the refrigerator and the sink; and the range placed at right angles to the sink (9, 24). This was the only arrangement in which all sides of the table were free from the wall. No one chose Arrangement I which had a work triangle with a perimeter just under the 22-foot limit.

In all the arrangements the space between the face of the counter or appliances and the table offered sufficient room for the subjects to perform such operations as removing items from the lower drawers in the base cabinets or adjusting the shelves in the oven. Less space than 36 inches would have been too little, for, in several instances, the bodies of the women touched the chair back

or the table behind them as they worked in a margin that size.

The Traffic Pattern.—The track pattern on the paper on the floor indicated the women stood close to the counters to work, side-stepping as they moved along the counter. If they traveled to a point more than a few steps away, the film showed that they pivoted and walked to their destination. The step pattern in front of the counters overlapped that alongside the table which indicated that, for the convenience of the worker in either the L or U formations, traffic lanes for other members of the family should be directed across the room opposite the turn of the L or the U. Mothers worked successfully around children who brought their playthings to the table away from the path between the range and the sink, and between the range and the mix center.

Counter Height and Clearance.—Previous research shows that optimum counter heights for sink centers and mixing centers are not the same (15, 27). This presents design complications where the counters are adjacent. Response in housing classes and discussion groups had shown little acceptance of a change in counter level. The L-shaped Arrangements I and III permitted some observation on the use of the area at the turn of the L where a 3-inch change occurred. The principal use of the area occurred during the dishwashing period. In Arrangement I soiled dishes were stacked in this area. In Arrangement III, wiped dishes not put directly into storage were placed there temporarily. In no case did dishes slip or fall because of the abrupt change of level nor were any adverse comments made by the participants.

Wilson and her colleagues suggested a minimum of 12 inches clearance between the counter and the base of the wall cabinet. The wall cabinets were set at 14 inches above the counter. One of the tallest subjects found that her saucepot struck the wall cabinet as she turned the contents of the pot into the serving bowls resting on the mix center counter, which was 34 inches high. This did not occur when she filled the bowls in Arrangement I where the counter next to the range was part of the sink center, the counter then being 37½ inches high. The films of her activities do not show that 34 inches was too low as a mix counter for her. This finding suggests that a wall cabinet design in which the base is narrower than the subsequent higher shelves would offer the low shelves the shorter women particularly commended without presenting a barrier for the taller women.

Counter Space for Mixing.—The women made little use of the corner spaces. They kept their supplies and utensils within the limits of the 32 inches of counter in front of which they could stand. The counter was rarely entirely covered during the three mixing processes observed: namely, making biscuits, cornbread and pie crust. The full 24-inch depth of the counter was used when the crust or biscuit dough was rolled out, the dough being placed in the foreground and such items as the bowl and measuring cups pushed to the back. Part of the space was covered by the containers of fat, salt, baking powder, etc., which were set temporarily on the counter after use although the storage was within arms reach.

This suggests that ease of working in a small space involves a get-use-return habit with reference to such items in order to make advantageous use of storage within close reach. Subjects who followed that work pattern kept their operations confined to a small portion of the counter. All the women tended to clear away most of their mixing supplies and tools before going on to another step in the meal process.

Counter Space for Serving.—Study of the counter loads showed that the peak load was most often just before the meal when the food was being put into the serving dishes ready to place on the table. The serving dishes covered considerable space. Either the coffee cups or the dessert dishes or both were usually spread out on the counter. The area chosen for these preparations for serving was that nearest the range and in Arrangements II and III were the same part of the counter as the mixing space. Again little use was made of the corner counter. Glasses were filled near the refrigerator if the water was not poured at the table; no more than 18 inches of the counter was used for this process.

Space to Clear and Wash Dishes.—All homemakers put away unused food, scraped and stacked dishes before starting to wash. They did not follow a consistent pattern as to whether they stacked the dishes as they removed them from the main course, but they did stack the dishes to the right of the sink bowl before starting to wash. In Arrangements II and III, they were able to put dishes, silver and some utensils on the 18-inch counter. Curiously no adverse comments were made, although they had to stack very precisely. Obviously they needed a little more space to work more freely. They tended to bring the glasses directly to the suds in one trip. They stated a preference for a double sink, or two pans

of water, and a drainage space. This is in line with the inventories reported in the regional housing survey. In this respect the 24-inch single bowl sink with a single drainboard was inadequate.

The pattern of putting air-dried or wiped dishes directly in the storage space was common to the eight subjects. The few guests who assisted with the dishwashing followed the same pattern insofar as it was easy for them to note where the articles were stored.

In Arrangement II the dishwasher found the movement of her left arm was hindered by the refrigerator. The face of the refrigerator made a barrier 9 inches from the center of the drainer before which she was working.

Space for Storage of Utensils

The Georgia Agricultural Experiment Station has reported the requirements for a mixing center for Southern rural kitchens and therefore attention was directed toward study of space for storing top-of-range utensils and dishwashing equipment.[1]

The kitchen utensils reported presented more similarity between socioeconomic groups than did the "everyday" dishes. Differences in price were reflected in quality rather than differences in shape or style. The number and size of utensils was found to be related to family size, the increase being more marked as the size of family exceeded six members (7).

The families in both socioeconomic groups reported more saucepots than are included in the minimum list of utensils developed as the result of the cooperative study carried on in the late 1940's by the Bureau of Human Nutrition and Home Economics and three state experiment stations (29). The families in this study almost unanimously reported having a teakettle, an item omitted from the above list.

Easily accessible space should be planned for the utensils given in Table 8 which is based on those reported as "frequently used" by five- and six-member families of the low socioeconomic group.

Families of seven or more reported larger vessels as indicated in Table 9.

The list of utensils reported by families of the higher socioeconomic group does not differ greatly from those of the lower.

[1]Space Requirements and Designs for Baking Centers. Mize, J. J. et. al. Ga. Agr. Exp. Sta. Bul. N. S. 23, May 1956 (33 pp.)

Pressure saucepans were reported sufficiently often to be included at the liberal level only (Table 10). The tables of "frequently used" utensils follow.

Table 8.—Utensils for Which Easily Accessible Storage Should Be Planned, Based on Those Reported as "Frequently Used" by Five- or Six-Member Families of the Low Socioeconomic Group[1]

Utensil	Basic level[2]	Liberal level[2]
Saucepans	1 — over 1 qt., less than 3 qt. 2 — 3 qt., less than 5 qt.	2 — over 1 qt., less than 3 qt. 2 — 3 qt., less than 5 qt.
Saucepots	1 — over 2 qt., less than 4 qt. 2 — 4 qt., less than 6 qt.	1 — over 2 qt., less than 4 qt. 2 — 4 qt., less than 6 qt. 1 — 6 qt., less than 8 qt.
Double boiler	—	1
Skillets	1 — over 6 in., less than 10 in. 1 — 10 in., less than 12½ in.	2 — over 6 in., less than 10 in. 1 — 10 in., less than 12½ in.
Coffee pot	1	1
Teakettle	1	1
Dishpans	2	2
Colander, sieve, or sink strainer	1	1

[1]Mixing and baking utensils not included.
[2]Where sizes are not given, number only was recorded on the schedule.

Table 9.—Utensils for Which Easily Accessible Storage Should Be Planned, Based on Those Reported as "Frequently Used" by Families of the Low Socioeconomic Group Having Seven or More Members[1]

Utensil	Basic level[2]	Liberal level[2]
Saucepans	1 — over 1 qt., less than 3 qt. 2 — 3 qt., less than 5 qt.	3 — 3 qt., less than 5 qt. 1 — 5 qt., or more
Double boiler	—	1
Saucepots	1 — over 2 qt., less than 4 qt. 1 — 6 qt., less than 8 qt.	2 — 4 qt., less than 6 qt. 1 — 8 qt., less than 11 qt.
Skillets	1 — over 6 in., less than 10 in. 1 — 10 in., less than 12½ in.	2 — 10 in., less than 12½ in. 1 — 12½ in. or more
Coffee pot	1	1
Teakettle	1	1
Dishpans	2	3
Colander, sieve, or sink strainer	1	1

[1]Mixing and baking utensils not included.
[2]Where sizes are not given, number only was recorded on the schedule.

Table 10.—Utensils for Which Easily Accessible Storage Should Be Planned, Based on Those Reported as "Frequently Used" by Families of the High Socioeconomic Group Which Have More Than Two Members[1]

Utensil	Basic level[2]	Liberal level[2]
Saucepans	1 — 1 qt. or less 2 — 3 qt., less than 5 qt.	1 — 1 qt. or less 1 — over 1 qt., less than 3 qt. 2 — 3 qt., less than 5 qt. 1 — pressure saucepan
Double boiler	1	1
Saucepots	1 — over 2 qt., less than 4 qt. 1 — 4 qt., less than 6 qt.	2 — 4 qt., less than 6 qt. 1 — 6 qt., less than 8 qt.
Skillets	1 — over 6 in., less than 10 in. 1 — 10 in., less than 12½ in.	2 — over 6 in., less than 10 in. 1 — 10 in., less than 12½ in.
Roaster	——	1 — larger than 9 x 13 in.
Coffee pot	1	1
Teakettle	1	1
Teapot	--	1
Dishpans	2	3
Dish drainer	1	1
Colander, sieve, or sink strainer	1	2

[1]Mixing and baking utensils not included.
[2]Where sizes are not given, number only was recorded on the schedule.

Space at two different centers is involved in desirable storage for the utensils "used frequently" that were studied. If stored at the "place of first use," the skillets should be in or near the range. Because the heavy iron skillet is popular in the South and fried foods are very frequently served, it would be well to avoid stacking skillets even though half the families reported only two. Three skillets, a No. 6, a No. 8, and a No. 10 with two flat covers were filed in the housing laboratory by placing one of the popularly advertised stackers in the side drawer of a 40-inch range. Enough room remained to store a package of prepared cereal, 2 pounds of rice, 2 pounds of oatmeal, and a pound box of macaroni. (These are the amounts of these foods 50 percent of the homemakers said they stored in their kitchens.)

Excepting the roaster and casseroles, the other utensils are more often first used near the source of water. Considerable competition for space therefore exists at the sink area. Because of their handles, saucepans, saucepots and double boilers lend them-

selves to hanging or to storage in deep shelves or in drawers below the work counter. Hanging utensils outside of closed storage does not have good acceptance. A drawer or sliding shelf permits bringing the pans forward for clearance. It also permits seeing enough to help avoid entangling the handles. The lids of present day pots are fitted, and it is helpful to have sufficient clearance to store the lid with the pan. In the laboratory the pots and pans listed in Table 8 above were stored in a drawer 15 x 8½ x 21 inches plus 22 inches of 12-inch shelving. Those on the liberal list would not go in two drawers of the size given.

The dishwashing equipment should be near the source of water also. The dimensions of dishpans and dish drainers are such that those utensils lend themselves to hanging or standing on end in order to use space too low to reach easily. Considering the frequency with which a dishpan is used other than for dishwashing, nesting might well be avoided when there are only two pans. A space 12-13 inches x 16-17 inches x 17-19 inches should hold two pans filed with a one-fourth inch divider or hung vertically. Where three pans are to be stored, two might well be nested. In the space where two are nested the dimension corresponding to the height of the pans should be increased 1 to 1½ inches.

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